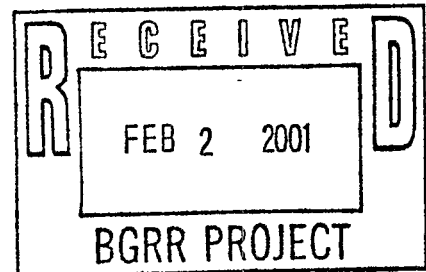




Department of Energy

Brookhaven Group
P.O. Box 5000
Upton, New York 11973



JAN 31 2001

Mr. Michael Bebon
Brookhaven Science Associates, LLC
Brookhaven National Laboratory
Upton, NY 11973

Dear Mr. Bebon:

SUBJECT: DEPARTMENT OF ENERGY (DOE) APPROVAL OF THE HAZARD CLASSIFICATION AND AUDITABLE SAFETY ANALYSIS (BGRR-002): BROOKHAVEN GRAPHITE RESEARCH REACTOR DECOMMISSIONING PROJECT (BGRR-DP)

- References:
- 1) Letter, M. Bebon, BNL to M. Holland, BHG, Subject: Submission of Brookhaven Graphite Research Reactor (BGRR) Decommissioning Project Auditable Safety Analysis, Revision 3, Dated: January 19, 2001
 - 2) Safety Evaluation Report, Brookhaven Graphite Research Reactor Decommissioning Project, Dated: January 30, 2001

This letter transmits approval of the subject document for project execution. The basis for this approval is contained in the enclosed Safety Evaluation Report (SER). The SER contains the technical evaluation for compliance with applicable requirements contained in the DOE Orders and Standards. The approved Auditable Safety Analysis (ASA) and SER constitute the Safety Authorization Agreement between DOE and Brookhaven Science Associates. These documents will be placed under configuration management. All commitments and controls established in the ASA and SER will be strictly enforced.

The BGRR DP continues to be classified as "RADIOLOGICAL" on an interim basis until final facility characterization is completed, or one year from the date of approval of the ASA, whichever is soonest. The work scope approved by this ASA is limited to surveillance, routine maintenance, and radiological/hazardous characterization.

Each phase of the decommissioning project will be preceded by additional characterization and hazards analysis after the work scope has been defined through an Engineering Evaluation/Cost Analysis (EE/CA) and screened using an approved Unresolved Safety Issue Determination (USID) process. Hazards analysis or safety evaluations performed as a result of the USID process

Mr. M. Bebon

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will be reviewed by the BGRR-DP Project Office and the DOE Brookhaven Group, and approved by the undersigned. Approved USIDs will be placed under configuration management and become an appendix to the Safety Authorization Agreement.

Should you have additional questions, please contact Mark Parsons on extension 7978.

Sincerely,



Michael D. Holland
Area Manager
Brookhaven Area Office

Enclosure:
As stated

cc: J. Roberts, EPG, CH, w/o encl.
M. Dikeakos, BAO, w/o encl.
G. Penny, BAO, w/o encl.
S. Pulsford, BNL, w/ encl.

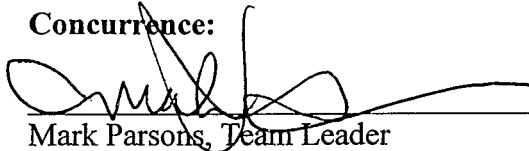
DOE SAFETY EVALUATION REPORT (SER)

BROOKHAVEN GRAPHITE RESEARCH REACTOR DECOMMISSIONING PROJECT


January 30, 2001

Concurrence and Approval Page

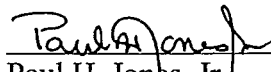
Concurrence:


Mark Parsons, Team Leader

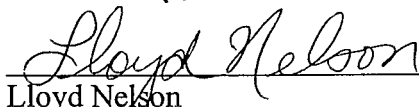
1/30/01
Date


Maria V. Dikeakos

1/30/01
Date

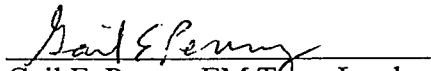

Paul H. Jones, Jr.

1/30/01
Date

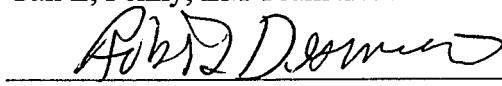

Lloyd Nelson

1/30/01
Date

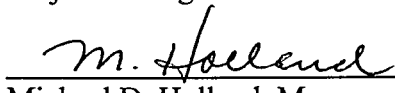
Approval for Implementation:


Gail E. Penny, EM Team Leader

1/30/01
Date


Robert L. Desmarais, Director
Project Management Division

1/31/01
Date


Michael D. Holland, Manager
Brookhaven Area Office

1/31/01
Date

DOE SAFETY EVALUATION REPORT (SER)

BROOKHAVEN GRAPHITE RESEARCH REACTOR DECOMMISSIONING PROJECT (BGRR-DP)

EXECUTIVE SUMMARY

This Safety Evaluation Report (SER) documents the basis for the U.S. Department of Energy (DOE) Brookhaven Area Office (BAO) extension of approval for Brookhaven Science Associates to execute the Brookhaven Graphite Research Reactor Decommissioning Project (BGRR-DP) described in the Project Management Plan (BGRR-01). This SER is based on the original SER performed to authorize work on this project (dated October 15, 1999) and evaluates new characterization data received over the past year.

The objectives of the ASA (which remain unchanged from original versions) are to identify the facility conditions and project scope, analyze accident and natural phenomena events for the activities authorized by the ASA, determine the facility hazard classification, and identify the safety management programs and controls necessary to protect the workers, the public and the environment for the BGRR Decommissioning Project (BGRR-DP).

A Safety Evaluation Review (SER) team composed of selected subject matter expert's conducted an in depth review of the ASA. The SER team consisted of the DOE-BGRR Project Manager, a health physicist, a facility representative with nuclear facility responsibilities, and another Project Manager with a nuclear quality assurance background. Each Safety Evaluation Review team member reviewed the entire document. The resolutions of team member comments have been incorporated into the ASA [3].

The SER team concludes that the BGRR facility classification should remain as RADIOLOGICAL on an interim basis (until final facility characterization is completed or one year from the issue of this SER, whichever is soonest), and that the ASA and Safety Evaluation Report provide an adequate safety basis for the specific work scope identified in the ASA. This conclusion is based on the following premises:

1. The radiological material previously stored in the Nuclear Material Storage Vault has been removed, thereby reducing the BGRR radiological inventory;
2. The form and distribution of the estimated Balance-of-Plant (BOP) radiological inventory is widely dispersed low-level contamination (WDLIC);
3. Characterization and sealing of the Reactor Pile and Biological Shield radiological inventory has been completed;

4. There are minimal quantities of hazardous material located within the BGRR facility;
5. The hazards analysis for the work scope authorized in the ASA does not yield any credible events that could result in hazard severity higher than "marginal" or risk category higher than "routine";
6. The BGRR radiological inventory is not releasable for airborne dispersion based on the hazards analysis and structural integrity of the confinement systems in place;
7. To establish a conservative final hazard classification of RADIOLOGICAL, a postulated accident scenario was analyzed that resulted in the release of 12.5% of the BOP radiological inventory to determine the Total Effective Dose Equivalent (TEDE) per DOE guidelines. This analysis resulted in a TEDE of 4.25 Rem in 24-hours at 30-meters due to direct exposure, inhalation, and longer term ingestion exposure to the maximally exposed individual;
8. An adequate margin of safety can be maintained without relying on safety structures, systems and components for the work scope defined in the ASA;
9. Adequate administrative controls (in lieu of Technical Safety Requirements) have been developed using a graded approach to insure an acceptable operating envelope;
10. All controls and commitments defined in the ASA will be enforced, and;
11. Each BGRR-DP sub-project will be analyzed through an Unresolved Safety Issue Determination (USID) process, which will be supported by detailed characterization information; detailed engineering and work packages; radiological work procedures; and a task specific Health and Safety Plan.

1.0 INTRODUCTION

1.1 Purpose

The purpose of the Hazard Classification and Auditable Safety Analysis (ASA) for the BGRR-DP is to establish an acceptable operational safety envelope for the BGRR facility. The ASA defines the work scope or operations that will be associated with the project, analyzes the radiological material-at-risk, examines postulated accidents and hazards relating to the execution of the project, documents the final hazard classification (FHC), and identifies appropriate controls and commitments necessary to insure the protection of the workers, public and the environment. During the course of completing the planning and execution of the BGRR Project Baseline, the USID process may require additional safety and hazard analysis. The results of the USID process will be documented and become a part of the Authorization Basis Manual after review and approval by DOE.

The purpose of the Safety Evaluation Report is to document the results of an independent review of the Hazard Classification and Auditable Safety Analysis for the Brookhaven Graphite Research Reactor Decommissioning Project (BGRR-002) by a selected group of subject matter experts (SMEs). Each SME was selected based on their knowledge and experience with nuclear decommissioning operations, nuclear safety, occupational safety and health, hazardous materials operations, and radiological facility operations.

1.2 Review Process

This Safety Evaluation Report (SER) presents the results of the DOE-directed Safety Evaluation Review Team review and approval of the ASA Revision 3 dated January 19, 2001. The review was conducted by a Safety Evaluation Review Team composed of DOE-Brookhaven Area Office staff.

1.3 Scope and Duration of the FHC and ASA Applicability

The Hazard Classification and Auditable Safety Analysis (ASA) will serve as the authorization basis for the BGRR Facility and sub-systems during the entire decommissioning project life cycle. USI determinations for each phase of the project scope will be added to the BGRR Authorization Basis Manual as they are developed and approved. The ASA will be modified or updated at the conclusion of the project for any post-closure groundwater monitoring or surveillance and maintenance, or will be cancelled.

2.0 HAZARDOUS SUBSTANCES INVENTORY AND HAZARD CLASSIFICATION

2.1 BGRR Balance of Plant (BOP) and Pile Inventory

The residual radiological inventory considered for the BGRR Facility hazard classification was based on analytical laboratory and in-situ measurements of contamination in the Canal, Canal House, and Water Treatment House.

Characterization efforts and calculations indicate that BOP inventory is 65.04% of the Category 3 limit. This reduction is primarily attributed to better quantification of the remaining mass of nuclear fuels. It should be noted that this material is not considered to be Material At Risk.

Pile graphite inventory estimates remain unchanged after incorporation of actual characterization data. Previous control rod radiological inventories were conservatively estimated at being < 200 Ci and have been reduced to 0.373 Ci using In-Situ Object Characterization System (ISOCs) equipment. This new figure represents 4.99 % of the Category 3 threshold, but is not considered to be Material At Risk (MAR).

The SER Team has reviewed the analysis that supports the radiological MAR inventory and concludes that the form and distribution of the material is widely dispersed low-level

contamination and activation of reactor pile and biological shield material, and that the inventory estimates are realistic.

2.2 Nuclear Material Storage Vault Inventory

Radiological materials have been removed from the 701 Building Nuclear Material Storage Vault. This removed material represented 80.54 % of the Category 3 threshold.

2.3 Hazardous Material Inventory

The non-radiological hazardous materials inventory in the BGRR Facility includes the following:

- Asbestos and asbestos-containing material
- Mercury
- Lead shielding and lead-based paint
- Polychlorinated biphenyl (PCB)
- Cadmium

3.0 HAZARDS ANALYSIS

3.1 Risk Assessment

The risk assessment of the BGRR is based on a methodical review of each of the initiating events and corresponding hazards associated with the facility, as originally defined by the Preliminary Hazards Analysis. Each initiating event and associated hazards were examined for severity, probability and risk category. Only one accident-initiating event is postulated to occur at any one time.

Considering the administrative controls and other mitigating factors, only routine industrial risks exist for the non-intrusive work scope authorized by the ASA.

3.2 Dose Assessment Summary

A review of Risk Analyses presented in the ASA shows no significant changes that would result in changes in facility classification.

Previous SER analyses that were based on engineering judgment have been captured in Section 3.2.2 of BGRR-002 as previously committed to in the SER.

The Dose Assessment was based on 340% of the originally estimated BOP inventory to allow for measurement uncertainties. A conservative approach assumed that 50% of this inventory was available for release and that 25% of the BOP facility areas would be involved in the postulated event. The original estimate of the BOP inventory was not updated with newer characterization data to allow for a sufficient margin for future removal activities that may have challenged a lower revised inventory figure.

3.3 Final Hazard Classification.

The SER Team concludes that BGRR facility final hazard classification remains unchanged and is RADIOLOGICAL based on: a) the balance of plant (BOP) radiological material at risk (MAR) = 0%, b) the dose consequences of an unmitigated accident is less than 10 Rem (~ 4.25 Rem) at 30-meters over a 24-hour period to the maximally exposed individual, and c) applying the methodology described in DOE-EM-STD-5502-94, Figure 1 therein.

3.4 SER Team Recommendation.

The SER Team recommends the final hazard classification of the BGRR Facility as RADIOLOGICAL on an INTERIM basis until complete radiological characterization data is obtained or one year has elapsed, and a detailed hazard classification is completed per DOE-STD-1027-92, Change 1.

4.0 CONTROL AND COMMITMENTS

4.1 Special Controls

BSA, through their work planning and control procedures, will strictly enforce the administrative controls identified in Section 1.3 of the ASA. Administrative controls are an acceptable basis for maintaining an adequate margin of safety in lieu of the derivation of Technical Safety Requirements for a Radiological Facility.

4.2 Project-Specific Controls

The use of Safety Significant Structures, Systems and Components are not required to maintain an adequate safety envelope for the work scope defined and authorized by the ASA and are therefore not included as a commitment.

4.3 Programmatic Controls

BSA will enforce the programmatic controls identified in Section 4.3 of the ASA during the execution of the BGRR-DP. Any anticipated or implied waiver from any controls identified will require DOE approval.

4.4 Commitments

4.4.1 Interim Classification. DOE approves the BGRR facility as Radiological on an interim basis until such time as adequate characterization information is available to support a classification determination in accordance with DOE-STD-1027-92, Change 1. Characterization information will support a radiological inventory

estimate of the following systems and/or subsystems: a) below-grade ducts and filter; b) fuel storage canal, canal house and water treatment system; c) reactor graphite pile, biological shield and associated experimental ports and systems.

- 4.4.2 Authorized Work Scope.** Only that work scope identified by the ASA will be executed until, or unless, the activity identified as new work is specifically authorized through the USI review and approval process.
- 4.4.3 Special Controls.** All special controls identified in the ASA will be adhered to.
- 4.4.4 Project-Specific Characterization.** Any work scope that is determined to be outside the authority of the ASA will be preceded by a characterization activity to determine radiological and/or hazardous materials inventories and an USI screening will be completed in accordance with the approved procedure.
- 4.4.5 Unreviewed Safety Issue Determination Procedure.** All work scope that is determined to be outside the authority of the ASA will be screened against an approved USI procedure [4]. A task-specific hazard analysis will be completed and reviewed as a part of the USI procedure for all work scope determined to be outside the authority of the ASA and must be approved by DOE before the work activities may begin. USIDs will be approved in accordance with DOE-BAO Administrative Instruction BHG-OA-17 [6]. Approval authority for USIDs will be delegated to the Manager, DOE Brookhaven Area Office.
- 4.4.6 Water Intrusion Level Surveillance Monitoring.** The water intrusion level surveillance monitoring system will remain operational until all below grade ducts and potential pathways for water intrusion have been adequately sealed [8].
- 4.5 BGRR Authorization Basis Manual.** The following documents will constitute the BGRR Authorization Basis Manual and will be placed under configuration control: a) Hazard Classification and Auditable Safety Analysis (BGRR-002); b) Safety Evaluation Report and DOE Approval; c) BGRR Health and Safety Plan; d) BGRR Quality Assurance Project Plan; and, e) Unresolved Safety Issue Determinations with DOE Approval(s).
- 4.6 Future Revisions to the ASA.** The BGRR Hazard Classification and Auditable Safety Analysis will be updated and revised at the conclusion of final facility characterization based on the results of the characterization data using DOE-STD-1027-92, Change 1, or one year from the issue of this SER, whichever is soonest. The final hazard categorization will be determined based on known or quantitative characterization information. Should the results of any sub-project characterization activity and/or USID determine that the facility categorization be changed or modified at any time, facility decommissioning safety programs will be re-evaluated to insure the protection of the workers, the public and the environment.

4.7 Records and References. Appendix A provides a reference to essential records, documentation and information generated throughout the review process and are available to the ASA approval authority on request. All USIDs that are subsequently developed will become an essential ASA control document subject to configuration management.

5.0 CONCLUSION

The Safety Evaluation Review (SER) Team concludes that the hazards associated with the work scope authorized by the ASA for Brookhaven Graphite Research Reactor Decommissioning Project have been adequately identified and evaluated. Further, the SER Team concludes that the BGRR Facility has been properly classified as RADIOLOGICAL on an interim basis pending additional characterization and analysis of radiological inventories. Adequate controls and commitments for the work scope activities identified in this ASA have been identified and will be enforced to protect the workers, the public or the environment. The SER Team recommends that the ASA continue to be approved for execution.

Appendix A

Records and References:

1. Department of Energy, *Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports*, DOE-STD-1104-96
2. Department of Energy, *Hazard Baseline Documentation*, DOE-EM-STD-5502-94
3. Memorandum, M. Bebon to M. Holland, subject: Submission of Brookhaven Graphite Research Reactor (BGRR) Auditable Safety Analysis, Revision 3, dated January 19, 2001.
4. BGRR Procedure, ERD-OPM-4.4, Rev. 0, *Safety Evaluations for Unreviewed Safety Issue Determinations*
5. BGRR Procedure, ERD-OPM-4.2, Rev 0, *Monitoring and Surveillance Procedure*
6. BHG Administrative Procedure, BHG-OA-17, *Review/Approval of Unresolved Safety Issue Determinations*, Rev 1
7. DOE Safety Evaluation Report – Brookhaven Graphite Research Reactor Decommissioning Project, dated October 15, 1999